

The Photoelectric effect

- **Photon in => Electron out.**
- No electrons are emitted if the frequency of the incident light falls below the cutoff frequency (even if the intensity is high).
- The cutoff frequency is a characteristic of the material.
- If the light frequency exceeds the cutoff frequency, the photocurrent is proportional to the light intensity.
- The maximum kinetic energy of the photoelectrons (stopping potential) increases with increasing light frequency, is independent of the light intensity.
- Instantaneous onset (less than 1 ns), even at low intensities.

$$K_{\max} = hf - \phi = eV_s$$

The Photoelectric effect

- The photon energy needs to be larger than the work function of the material.
- If the light intensity is increased or decreased, then the number of photons changes, but not their energy. Therefore, the stopping potential (maximum kinetic energy of the photo-electrons) is independent of the light intensity.
- The stopping potential increases with increasing photo energy.
- Instantaneous emission is consistent with the particle theory for light.

$$K_{\max} = hf - \mathbf{f} = eV_s$$

$$f_c = c / \mathbf{l}_c = \mathbf{f} / h$$